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NATIONAL DAM INSPECTION PROGRAM. RILEY RUN DAM (NDI PA-386), OH--ETC(U)
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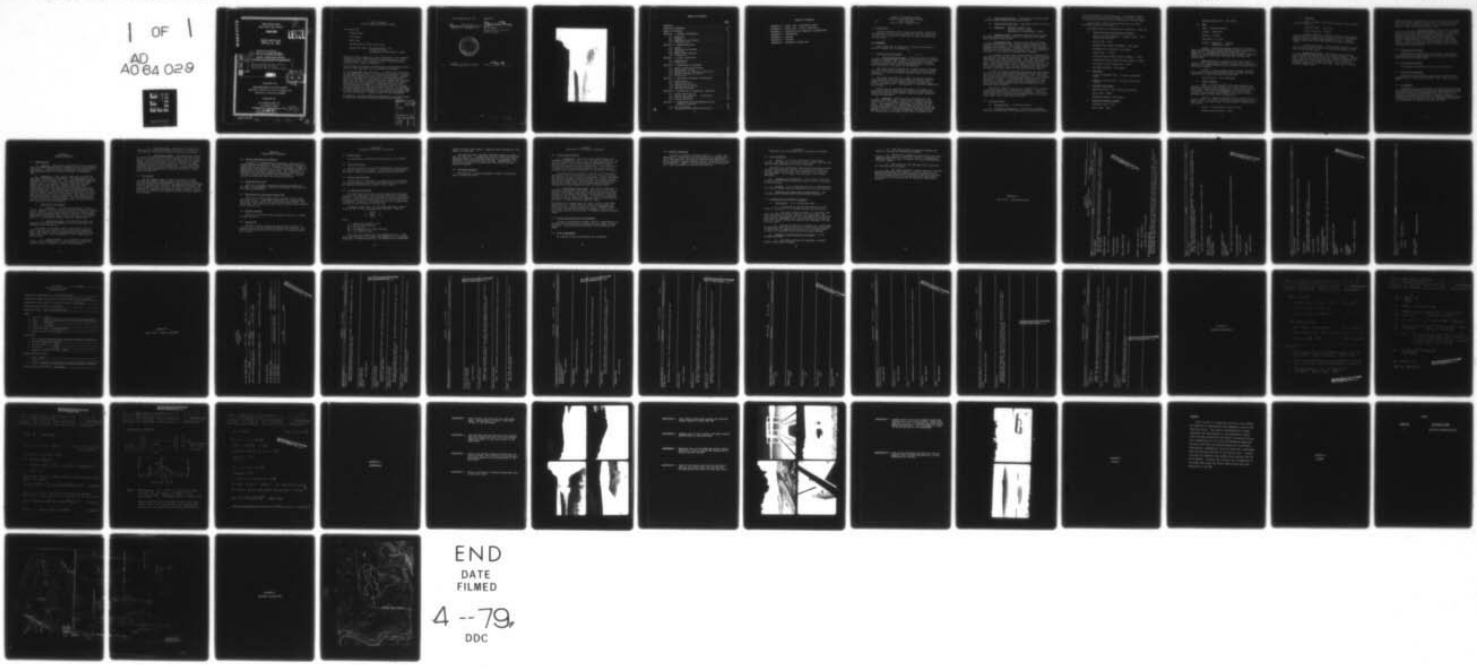

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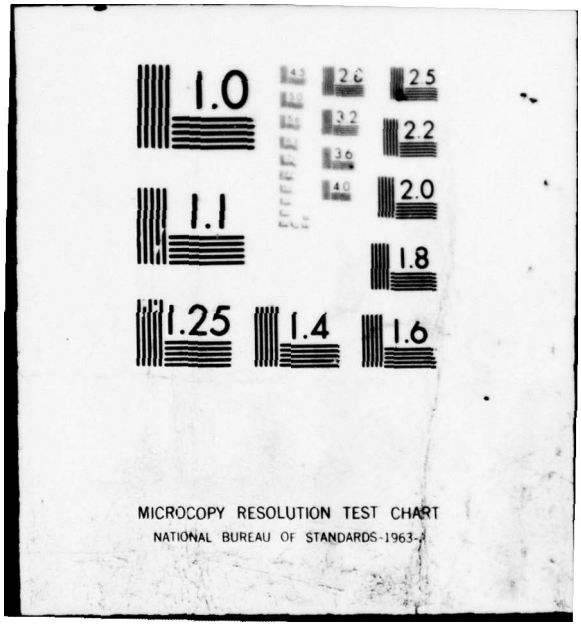
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OHIO RIVER BASIN
RILEY RUN, ELK COUNTY

PENNSYLVANIA

LEVEL II

RILEY RUN DAM
NDI No. Pa. - 386

Contract No. DACW31-78-C-0052

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM.

Riley Run Dam (NDI PA-386), Ohio River Basin, Riley Run, Elk County, Pennsylvania. Phase I Inspection Report.

PREPARED FOR

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

PREPARED BY

GAI CONSULTANTS, INC.
570 BEATTY ROAD
MONROEVILLE, PENNSYLVANIA 15146

59 p.

AUGUST 1978

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Riley Run Dam

Pennsylvania

Elk County

Riley Run

29 June 1978 (visual inspection)

Inspection Team - GAI Consultants, Inc.
570 Beatty Road
Monroeville, Pennsylvania 15146

Based on visual inspection, past performance, and available engineering data, the dam and its appurtenances are considered to be in fair condition, and in need of overall rehabilitation and/or maintenance.

The spillway is capable of passing the flow resulting from a storm of PMF magnitude and is considered adequate.

It is recommended that the owner: 1) remove the overgrowth on the embankment slopes; 2) develop and implement a regular maintenance program; 3) locate the toe drain exit, provide positive drainage away from the toe, and determine the source of the water in the swampy areas between the stilling basin and the dam; 4) backfill ruts to restore the embankment crest and take measures to protect the crest from further vehicular damage; 5) restore the riprap cover near the intake tower; 6) develop a formal plan for the emergency drawdown should the need arise; and 7) develop a formal plan for the warning and evacuation of downstream residences that could be effected by a sudden failure of the embankment.

In addition, the dam should be inspected on a periodic basis to check for hazardous conditions which might develop.

GAI Consultants, Inc.

Bernard M. Mihaldin

Bernard M. Mihaldin, P.E.

Date August 28, 1978

Approved:

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

Date 11 Sep 78

Overview Photograph of Riley Run Dam

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
RILEY RUN DAM
NDI# PA-386, PENNDER 24-25

ABSTRACT

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

~~1.1 Purpose~~.

The purpose is to determine if the dam constitutes a hazard to human life or property.

ABSTRACT

1.2 Description of Project.

a. Dam and Appurtenances. Riley Run Dam is an earth embankment approximately 2,300 feet in length with a maximum height of 56 feet. The facility is served by an uncontrolled natural channel spillway equipped with a concrete ogee-crested weir and apron at the entrance.

The outlet works consists of a single 16-inch diameter cast iron blow-off pipe encased in concrete with the inlet located at an intake structure upstream and to the left of dam center.

The intake structure is a small reinforced concrete tower modified since its construction to include only a single functional intake portal located near the water surface at normal pool. Consequently, no drawdown capability is provided.

Beyond the toe and near the center of the dam is a wastewater settling basin which collects and detains discharge from the low flow conduit (blow-off pipe) before it is passed downstream.

b. Location. Riley Run Dam is located near the headwaters of Riley Run, a first order tributary of the Clarion River, in Ridgway Township, Elk County, Pennsylvania. The community of Johnsonburg, Pennsylvania, is located approximately 1.7 miles northeast of the facility. The dam, reservoir, and watershed are contained within the Ridgway U.S.G.S. 7.5 minute quadrangle (see Appendix G). The coordinates of the dam are N41° 28.3' and W78° 42.3'.

c. Size Classification. Intermediate (56 feet high, 3,721 acre-feet storage at spillway crest).

d. Hazard Classification. High (see Section 3.1.c.5).

e. Ownership. PENNTECH Papers, Inc.
100 West Center Street
Johnsonburg, Pennsylvania 15845

f. Purpose of Dam. Riley Run Dam serves as a sedimentation basin for the detention of effluent from paper mill processing operations.

g. Historical Data. Riley Run Dam was originally constructed in 1938 by the Castanea Paper Company of Johnsonburg, Pennsylvania. The firm's corporate heading has changed twice since 1938. PENNTECH Papers, Inc., postdated the New York and Pennsylvania Company, Inc., which was the successor to the original Castanea Paper Company.

J. C. Morin of Lock Haven, Pennsylvania, designed both the original and present facilities as a registered engineer employed by the paper manufacturer. The 1938 dam consisted of a rolled earth structure 30 feet high and 1,150 feet long. The facility had a clay-filled cut-off trench at the base of the longitudinal axis, a small concrete spillway at the right abutment, and a 16-inch diameter cast iron pipe encased in concrete which served as the outlet conduit.

In 1957, Mr. Morin submitted the design for the present facility to the Pennsylvania Department of Water Resources for the New York and Pennsylvania Company, Inc. Basically, the design called for increasing the height of the structure from 30 to 56 feet. It provided for the facility to be served by a natural channel spillway equipped with a 100-foot concrete ogee-crested weir and an extension of the existing outlet conduit.

Inspection reports contained in PennDER files indicate no serious operational deficiencies; however, a lack of proper maintenance over the years is apparent. Five separate reports are available from PennDER files covering the years 1940, 1942, 1948, 1965, and 1977.

1.3 Pertinent Data.

a. Drainage Area. 0.78 square miles.

b. Discharge at Dam Site. According to PENNTECH personnel present during the inspection, discharge records

are not available for the facility. The maximum flood at this site and its resulting discharge over the spillway could not be recalled with any certainty by those present.

Outlet works conduit at operating pool elevation - discharge curve not available.

Spillway capacity at maximum pool elevation - 4863 cfs.

c. Elevation (feet above mean sea level).

Top of Spillway Wingwall - Assumed datum - estimated to be 1776.0.

Top of Dam - 1776.

Maximum Pool Design Surcharge - Not known.

Maximum Pool of Record - Not known.

Normal Pool - 1770.5.

Upstream Portal Invert Outlet Conduit ≈ 1742.

Downstream Portal Invert Outlet Conduit ≈ 1738.

Streambed at Dam Centerline ≈ 1720.

Maximum Tailwater - Not known.

d. Reservoir.

Length of Maximum Pool ≈ 1.0 mile (elevation 1776).

Length of Normal Pool ≈ 0.9 mile (elevation 1770.5).

e. Storage (acre-feet).

Spillway Crest ≈ 3725 (elevation 1770.5).

Top of Dam ≈ 5000.

Design Surcharge - Not known.

f. Reservoir Surface (acres).

Spillway Crest - 232.

Top of Dam ≈ 260.

Maximum Design Pool - Not known.

g. Dam.

Type - Rolled earthfill.

Length - 2300 feet.

Height - 56 feet.

Top Width - 12 feet.

Slopes - Upstream 2.5H:1V
Downstream 2H:1V

Zoning - Available drawings indicate the embankment is constructed of rolled earthfill with a central zone comprised of "selected impervious clayey material". In addition, the embankment is equipped with a small stone and gravel toe drain and eight tile drainage laterals (not dimensioned).

Impervious Core - An application report dated June 7, 1957, indicates the intent to construct a clay core; however, the design drawings do not define the dimensions or the limits clearly.

Cutoff - A clay cutoff trench is shown for both the original and present structures on available drawings. Dimensions of these trenches are undefined.

Grout Curtain - None indicated.

h. Outlet Conduit.

Type - 16-inch diameter cast iron blow-off line encased in concrete with invert at the base of the intake tower and intake portal approximately 7 feet below the top of the dam. This conduit discharges flow into a small concrete-lined channel which leads to the stilling basin located beyond the toe (see Photograph 8).

Closure - Manually operated gate controls flow at intake portal. The top of the tower is open (covered with a steel grate) and flow cannot be controlled for heads above this level.

Access - Foot bridge to intake tower.

Regulating Facilities - None.

i. Spillway.

Type - Uncontrolled natural channel with concrete ogee-crested weir.

Length of Weir - 100 feet.

Crest Elevation - 1770.5.

Upstream Channel - Drawings indicate the channel immediately upstream of the spillway weir to be reinforced concrete with a forebay depth equaling 2 feet. Rubble masonry apparently lines the channel in front of the concrete.

Downstream Channel - Curved earth channel decreasing in width from 100 feet at the spillway entrance to 50 feet at the channel exit.

j. Regulating Outlets. Discharge at low reservoir levels is handled by the 16-inch low level conduit. Flow is controlled at the intake portal by a manually operated steel gate. The top of the tower is open, and flow cannot be controlled for heads above this level. As a result of modifications to the intake structure, there are no current drawdown capabilities.

discharges into a sedimentation pond located just beyond the toe. The outlet conduit is apparently an extension of the conduit at the original facility. It is constructed with three 4.4-foot square anti-seep collars.

c) Intake Structure. The intake structure is an 8-foot square reinforced concrete tower. Originally designed to receive flow from three different levels in the tower, it has since been modified so that flow can be decanted from only the uppermost portal whose invert is located approximately 6 feet below the top of the intake tower . (Portal details are not available. Exact invert elevation was not attainable since the intake was functioning during the inspection.)

2.2 Construction Records.

Construction records are not available. Four photographs taken during construction of the original structure are contained in PennDER files.

2.3 Operational Records.

No operational records are kept at this facility.

2.4 Other Investigations.

Several state inspection reports are available from PennDER files. They are dated 1940, 1942, 1948, 1965, and 1977.

2.5 Evaluation.

Sufficient data are available to indicate the structure was adequately engineered with the possible exception of the drainage system at the downstream toe. The drain is susceptible to clogging from runoff and requires regular maintenance at the collector exit. There is also no definite zoning of material ensuring that the downstream portion of the embankment is more pervious than the core.

SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of this structure and its related appurtenances suggests the dam is performing adequately. A general lack of maintenance contributes to a poor appearance but its overall condition is considered fair.

b. Embankment. The visual inspection revealed the embankment to be in fair condition. The downstream face is overgrown (see Photograph 4). The latest PennDER inspection report dated 5-5-77 also noted the overgrowth and recommended that it be removed. Several tire ruts, some in excess of one-foot deep are evident along the crest. Provisions to restrict entry onto the structure are apparently ineffective. The riprap along the upstream face was in good condition except for an area of about 50 to 75 feet near the intake tower foot bridge where the riprap has been displaced and some erosion is apparent. The upstream face is also overgrown in several areas. The flat area beyond the toe and around the sedimentation pond is poorly drained and swamp-like (see Photograph 8).

c. Appurtenant Structures.

1. Spillway. The spillway structure is functional; however, it is in need of surficial repair and maintenance. The weir is in good condition but the concrete apron immediately downstream shows signs of scaling. The channel downstream is overgrown and littered with debris (see Photograph 1). The approach channel appeared unobstructed.

2. Intake Structure. The intake structure is accessible by means of a structural steel footbridge which appears in good condition.

The tower, on the other hand, shows several areas of severe spalling and general concrete and steel deterioration. The reservoir level can apparently be controlled to some extent with a gate suspended by a wire rope over the intake notch.

3. Outlet Conduit. Very little of the outlet conduit could be observed. It was discharging during the inspection and is apparently functioning properly.

4. Reservoir Area. The slopes adjoining the reservoir area are heavily wooded and gentle to moderate in inclination. No signs of slope distress were observed.

5. Downstream Channel. The downstream channel is characterized by steep heavily wooded slopes from just below the spillway exit to its confluence with the Clarion River. Further downstream, near the community of Ridgway, Pennsylvania, the low lying areas are occupied by heavy industry including a power substation. It is conceivable that these areas could be affected by a sudden failure of Riley Run Dam; consequently, the site was given a "high" hazard designation.

3.2 Evaluation.

The embankment shows no signs of seepage or slope distress but suffers from a general lack of maintenance. The area beyond the downstream toe (containing the discharge from the underdrains) is poorly drained and overgrown. The intake tower has been modified, and there are no provisions presently to drawdown the reservoir under emergency conditions or to control flow through the outlet conduit should a leak develop.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Normal Operational Procedure.

According to PENNTECH Paper personnel, there are no formal manuals containing information regarding operational procedures at the facility. Processing effluent (4 MGD) is pumped into the reservoir and in turn supernatant (4 MGD) is decanted off through the outlet works. The supernatant is directed into the small sedimentation pond just beyond the toe before passing downstream (see Photograph 9). Excess inflow is discharged over the emergency spillway.

4.2 Maintenance of Dam.

There is no formal, regular maintenance program for the dam. The embankment, spillway, and intake structure are all readily accessible.

4.3 Maintenance of Operating Facilities.

There is no regular maintenance program for the operating facilities. A PENNTECH representative indicated the two lower portals within the intake tower were sealed a few years ago. This action was taken when the gates were observed to be "pushing in".

4.4 Warning Systems.

There are no formal warning systems presently in effect at this facility.

4.5 Evaluation.

Lack of a formal maintenance program has resulted in overall neglect of the slopes and downstream toe area. The facility is essentially self-regulating. No warning system is in effect.

SECTION 5
HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No hydrologic or hydraulic design data are available.

5.2 Experience Data.

No data relative to the past performance of the dam and its outlet works are available. All observed appurtenances are intact indicating probable adequate past performance.

5.3 Visual Observations.

On the date of inspection, no conditions were observed that would indicate that the appurtenant structures could not operate satisfactorily during a flood event.

5.4 Overtopping Potential.

The "PMF Peak Flow" for this watershed was determined based on data supplied by the Corps of Engineers, Baltimore District. Specifically, the data pertain to a stream gaging station located on the East Branch of the Clarion River at Johnsonburg. Based on a drainage area of 72.4 square miles, the PMF at this location is 53,100 cfs.

Utilizing these data, the following equation yields a value of PMF for the watershed above the dam. That is:

$$Q_1 = \left[\frac{D_1}{D_2}\right]^n Q_2$$

where

n = empirical constant = 0.7
Q_1 = PMF at Riley Run Dam
Q_2 = 53,100 cfs
D_2 = drainage area at Riley Run Dam
D_1 = 72.4 square miles

The value of n chosen for this analysis is 0.7. This value falls within those values recommended by the Corps of Engineers, Pittsburgh District, for comparison of watersheds

within the Ohio River Basin. Based on this information, PMF Peak Q = 2,227 cfs.

The spillway has a maximum discharge capacity equivalent to 4,863 cfs. A comparison of peak inflow with maximum discharge shows the discharge capacity to be greater than the peak inflow resulting from the PMF. Consequently, the spillway is capable of handling the PMF without the dam being overtopped.

5.5 Spillway Adequacy.

The spillway is deemed adequate in that it will pass and/or contain the PMF.

SECTION 6
EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. Based on visual observations, the embankment appeared to be in fair structural condition. No areas of seepage were found along the embankment face or at the abutments. The area just beyond the toe is poorly drained and swamp-like (see Photograph 8). This condition is possibly due to discharge from the toe drain, but an investigation should be undertaken to determine its source.

The conditions described in Section 3.1.b relative to overgrowth, tire ruts along the crest, and loss of riprap all indicate a lack of proper maintenance. Heavy overgrowth and lack of adequate riprap can result in serious seepage and erosion conditions. Consequently, the problems evident during the visual inspection are considered potentially hazardous and steps should be taken to correct them.

b. Appurtenant Structures. The visual inspection indicated the spillway is in fair condition, but in need of general maintenance. Spalling, scaling, and cracking were evident on the downstream channel floor; however, the weir appeared to be in good condition. In addition, vegetation is growing freely within the channel; and if this situation persists, it could seriously obstruct flow.

The intake tower shows signs of severe concrete and steel deterioration. Inflow (or pool level) can apparently be controlled to a limited degree by a gate suspended from a wire rope attached to the steel framework. There are no provisions for low level inflow or drawdown should the need arise.

6.2 Design and Construction Techniques.

No actual design data, design reports, computations, or construction reports were available for any aspect of this facility. A pre-construction drawing was provided by the owner.

6.3 Past Performance.

No records of past performance are available.

6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1. Since the embankment is broad based and constructed of residual soils, it is believed that the dam can withstand the additional minor earthquake induced dynamic forces associated with Zone 1 earthquakes. However, no calculations or investigations, etc., were performed to confirm this opinion.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The visual inspection, operational history, and available engineering data suggest that the dam and its appurtenances are in fair condition.

Hydraulic and hydrologic calculations performed as part of this investigation indicate the spillway is capable of passing and/or storing the flow resulting from a storm of PMF magnitude. As a result, the spillway is considered adequate.

b. Adequacy of Information. The available data are considered sufficient to make an accurate Phase I assessment of the facility.

c. Urgency. It is suggested that the recommendations and studies listed below be implemented as soon as possible.

d. Necessity for Additional Investigations. The investigations listed below are considered necessary.

7.2 Recommendations/Remedial Measures.

a. Facilities. It is recommended that:

1. A contingency plan be developed which will allow the reservoir to be drained should the need arise.

2. The owner locate and open, if necessary, the toe drain which reportedly empties into Riley Run. The owner should also provide positive and unobstructed drainage away from the embankment toe, and investigate the source of the water in the swampy area between the embankment and the stilling basin.

3. The owner retain the services of a registered professional engineer experienced in design and construction of earth dams to inspect the facility on a periodic basis to check for hazardous conditions which might develop.

b. Operation and Maintenance Procedures. It is recommended that:

1. The owner develop and implement a formal, regular maintenance program.

2. The heavy growth of trees and bushes presently on the dam be cleared and grubbed.

3. The dam be regraded to restore any low areas caused by settlement or vehicular traffic. Subsequently, measures should be taken to protect the crest from further vehicular damage.

4. The riprap on the upstream face of the dam be replaced where necessary.

5. The owner develop a warning system to provide for the expeditious notification and safe evacuation of downstream inhabitants should hazardous conditions develop. The plan should provide for round-the-clock surveillance of the facility during periods of unusually heavy precipitation.

APPENDIX A

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Riley Run Dam

ID # PA-386
PennDER 24-45

ITEM	REMARKS	SHEET 1

AS-BUILT DRAWINGS

None of the drawings available are specifically marked "as-built". Drawings available include one dated 1957 (present facility) and four dated 1938 (original facility). All drawings are by J.C. Morin.

REGIONAL VICINITY MAP

See U.S.G.S. 7.5 minute quadrange, Ridgway, Pennsylvania.

CONSTRUCTION HISTORY

Not available.

TYPICAL SECTIONS OF DAM

See Figure 1.

OUTLETS - PLAN See Figure 1.

- DETAILS See Figure 1.

- DISCHARGE RATINGS Not available.

RAINFALL/RESERVOIR RECORDS

Rainfall records available at sewage treatment plant (covers last 30 to 40 years). Some reservoir records are also available. According to Penn Tech personnel, if one inch of rainfall falls within the Riley Run watershed, the reservoir will rise approximately one inch.

ITEM	REMARKS	ID #	SHEET 2

DESIGN REPORTS

Designed by the paper mill engineering department and J.C. Morin who was an employee at the time. Some data are available at the paper mill. This information is substantially the same as that data contained in PennDER files.

GEOLOGY REPORTS

Available boring and test data are contained in PennDER files.

DESIGN COMPUTATIONS
HYDROLOGY & HYDRAULICS
DAM STABILITY
SEEPAGE STUDIES

None available.

MATERIALS INVESTIGATIONS
BORING RECORDS
LABORATORY
FIELD

1957 boring logs and laboratory data are available from PennDER files.

POST-CONSTRUCTION SURVEYS OF DAM

None since 1957.

BORROW SOURCES

Within reservoir.

ITEM	REMARKS	ID #	SHEET 3

MONITORING SYSTEMS

Water quality (monitoring wells) installed three or four years ago.

MODIFICATIONS

Original structure was raised 26 feet in 1957.
Intake tower modified in 1969. Lower intake portals were sealed.

HIGH POOL RECORDS

None available.

POST CONSTRUCTION ENGINEERING
STUDIES AND REPORTS

Inspection reports dated 1940, 1942, 1948, 1965, and 1977 available from PennDER files.

PRIOR ACCIDENTS OR FAILURE OF DAM
DESCRIPTION
REPORTS

None

MAINTENANCE
OPERATION
RECORDS

As needed. No formal program.

ITEM	REMARKS	ID #	SHEET 4
SPILLWAY PLAN			
SECTIONS	See Figure 1.		
DETAILS	" " "		
OPERATING EQUIPMENT PLANS & DETAILS	Drawing dated 1957.		

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

ID # PA-386

DRAINAGE AREA CHARACTERISTICS: 0.78 square miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1770.5 (3,725 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): Not known

ELEVATION MAXIMUM DESIGN POOL: Not known

ELEVATION TOP DAM: 1776 (≈5000 acre-feet)

CREST:

a. Elevation 1770.5
b. Type Natural channel with concrete ogee-shaped weir
c. Width 100 feet
d. Length 350 feet
e. Location Spillover right abutment
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 16-inch diameter cast iron pipe encased in concrete
b. Location Left of dam center
c. Entrance Inverts ≈ 1742
d. Exit Inverts ≈ 1738
e. Emergency Draindown Facilities None

HYDROMETEOROLOGICAL GAGES:

a. Type None
b. Location -
c. Records Rainfall records kept at sewage treatment facility

MAXIMUM NON-DAMAGING DISCHARGE: Not known

APPENDIX B

CHECK LIST - VISUAL INSPECTION

CHECK LIST
VISUAL INSPECTION
PHASE 1

DAM NAME Riley Run Dam COUNTY ELK STATE PA NDI# PA-386 ID # PennDER 24-45

TYPE OF DAM Earth HAZARD CATEGORY High

DATE(S) INSPECTION 29 June 1978 WEATHER Partly Cloudy TEMPERATURE 75-80°

POOL ELEVATION AT TIME OF INSPECTION 1768.6 M.S.L. TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL:

B. M. Mihalcin (GAI)		PENNTECH Personnel
J. P. Nairn (GAI)	Chandu Patell (PennDER)	Myles Sallack
D. L. Bonk (GAI)		

D. L. Bonk RECORDER

EMBANKMENT ID# PA-386 Sheet 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Small shrinkage cracks on the crest are visible. Tire ruts (approximately 1 foot deep) are located along entire length of the crest.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Noticeable sloughing along both sides of tower footbridge apparently due to a lack of riprap in these areas.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal alignment is slightly off. This condition is most noticeable when observing the embankment from atop the crest.	
RIPRAP FAILURES	Riprap missing along both sides of the footbridge. Not necessarily a failure of the riprap. Could be result of vandalism.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS

JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM

Good condition.

ANY NOTICEABLE SEEPAGE

Swampy area noticeable below the toe where the ground surface flattens. Water evident on all sides of stilling basin. No seepage through embankment was observed.

STAFF GAGE AND RECORDER

None. Top of concrete on outlet structure used as datum according to owner's representative.

DRAINS

Toe drain and laterals reportedly provided as shown on Figure 1. Toe drain outlet to Riley Run not observed.

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed.	
INTAKE STRUCTURE	Concrete is badly deteriorated.	
OUTLET STRUCTURE	Satisfactory condition. Outlet conduit discharging during inspection.	
OUTLET CHANNEL	Rock lined natural channel in apparent satisfactory condition. Channel floor could not be seen due to the polluted nature of the discharge flow.	
EMERGENCY GATE	None observed.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Satisfactory condition. No visible cracking or spalling along the ogee.	
APPROACH CHANNEL	Clear of debris.	
DISCHARGE CHANNEL	Visible spalling and cracking of apron floor. Debris is scattered in channel below the ogee. Vegetation growing freely in spillway channel. Lack of maintenance is obvious.	
BRIDGE AND PIERS	Culverts which run beneath a railroad embankment and discharge water directly into the Clarion River at a point 1.4 miles downstream.	

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS

MONUMENTATION/SURVEYS

None observed.

OBSERVATION WELLS

None observed.

WEIRS

Rectangular weir at downstream end of stilling basin discharging during inspection.

PIEZOMETERS

None observed.

OTHERS

None observed.

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES		
Moderate and heavily wooded.		
SEDIMENTATION		
Significant sedimentation has occurred according to conversations with the owner's representative. However, this is its primary function, that is, to collect paper mill waste sediment. No surveys to gage actual amount.		

DOWNSTREAM CHANNEL ID # PA-386 SHEET 8

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Beyond the spillway, no obstructions were observed until Riley Run reaches the Clarion River. At this point flow passes underneath a concrete railroad bridge.	
SLOPES	The slopes just downstream of the dam are steep and heavily wooded. After discharging into the Clarion River the floodplain is wide.	
APPROXIMATE NO. OF HOMES AND POPULATION	Heavy industry including a power substation is located in low lying areas near Ridgway and is likely to be affected by high water.	

APPENDIX C

HYDROLOGY/HYDRAULICS

SUBJECT DAM SAFETY INSPECTION
RILEY RUN DAM

BY DLB DATE 7-27-78 PROJ. NO. 78-501-386

CHKD. BY JTS DATE 7-26-78 SHEET NO. 1 OF 5

gai CONSULTANTS, INC.
Engineers • Geologists • Planners
Environmental Specialists

DAM STATISTICS

MAXIMUM HEIGHT OF DAM = 56 FEET (REF 1, PG 1)

DRAINAGE AREA = 0.78 SQ. MI. "

STORAGE CAPACITY = 3720 AC-FT "

SIZE CLASSIFICATION

DAM SIZE - INTERMEDIATE (REF 2 : TABLE 1)

HAZARD RATING - HIGH (POSSIBLE LOSS OF LIFE IS GREATER THAN 3)

REQUIRED SDF - PMF (REF 2 : TABLE 3)

REFERENCES

1 "REPORT UPON THE APPLICATION OF NEW YORK & PENNSYLVANIA CO., INC." PENNA. WATER SUPPLY COMMISSION, JUNE 7, 1957

2 "RECOMMENDED GUIDELINES FOR SAFETY INSPECTION OF DAMS" DEPT. OF THE ARMY - OFFICE OF CHEIF ENGINEER, APPENDIX D

3 "STANDARD HANDBOOK FOR CIVIL ENGINEERS" F. S. MERRITT, McGRAW-HILL 1976

OBJECT DAM SAFETY INSPECTION
RILEY RUN DAM

BY D. P. DATE 7-22-78 PROJ. NO. 78-501-386

CHKD. BY JTS DATE 7-26-78 SHEET NO. 2 OF 5

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$$Q_1 = \left[\frac{D_1}{D_2}\right]^n Q_2$$

Q_1 = PMF AT RILEY RUN DAM

Q_2 = PMF FROM STATION AT EAST BRANCH OF CLARION RIVER
Q_2 = 53,100 CFS (SUPPLIED BY CORPS)

D_1 = DRAINAGE AREA AT RILEY RUN DAM = 0.78 SQ. MI.

D_2 = DRAINAGE AREA AT EAST BRANCH OF CLARION RIVER
D_2 = 72.4 SQ. MI. (SUPPLIED BY CORPS)

n = 0.7 (DETERMINED BASED ON STREAM FLOW DATA FOR THE OHIO RIVER BASIN. CONFORMS TO THAT RANGE OF VALUES RECOMMENDED BY THE CORPS OF ENGINEERS, PITTSBURGH DISTRICT 0.6 TO 0.8)

$$Q_1 = \left[\frac{0.78 \text{ SQ. MI}}{72.4 \text{ SQ. MI.}}\right]^{0.7} (53{,}100 \text{ CFS})$$

Q_1 = 2227 CFS

PMF Q = 2227 CFS

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PMF Q = 2227 CFS

TOTAL TIME OF FLOW = 30 HRS (REF: COE CURVE, OHIO RIVER BASIN)

VOLUME OF INFLOW HYDROGRAPH

$V = \frac{1}{2}(Q_{IMAX})(TIME)$

$= \frac{1}{2}(2227\ CFS)(30\ HRS)(3600\ SEC/HR)(1\ ACRE/43560\ SQ.FT.)$

$= 2761$ AC-FT

DETERMINE AVERAGE RUNOFF REQUIRED TO PRODUCE THE ABOVE VOLUME OF INFLOW.

$(2761\ AC\text{-}FT)(1\ SQ.MI./640\ ACRES)(12\ IN/FT)/(0.78\ SQ.MI.) = 66.4$ INCHES

VOLUMES PRODUCED BY RUNOFF IN EXCESS OF 26 INCHES ARE TO BE RECALCULATED USING 26 INCHES AS AN UPPER BOUND.

$(26\ INCHES)(0.78\ SQ.MI.)(640\ ACRES/SQ.MI.)(1\ FT/12\ IN.) = 1082$ AC-FT

VOLUME OF INFLOW (RECALCULATED) = 1082 AC-FT

SUBJECT DAM SAFETY INSPECTION
BILLY BIRL DAM

BY DLP DATE 7-27-78 PROJ. NO. 78-501-396

CHKD. BY JTS DATE 7-26-78 SHEET NO. 4 OF 5

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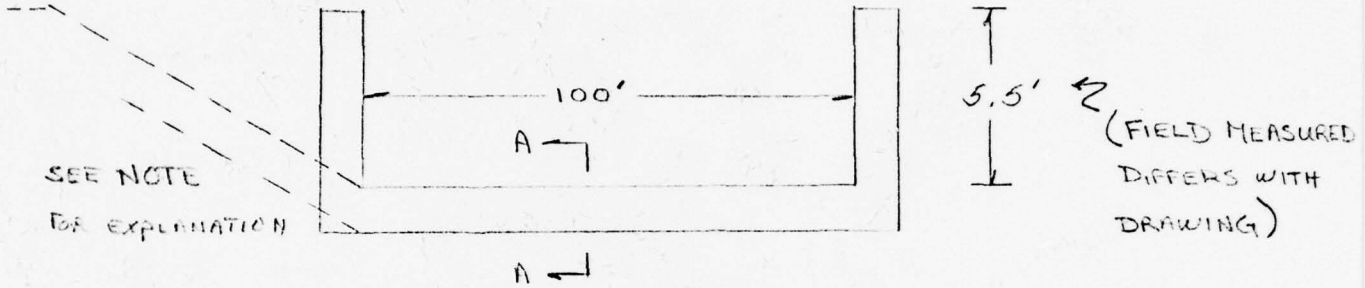
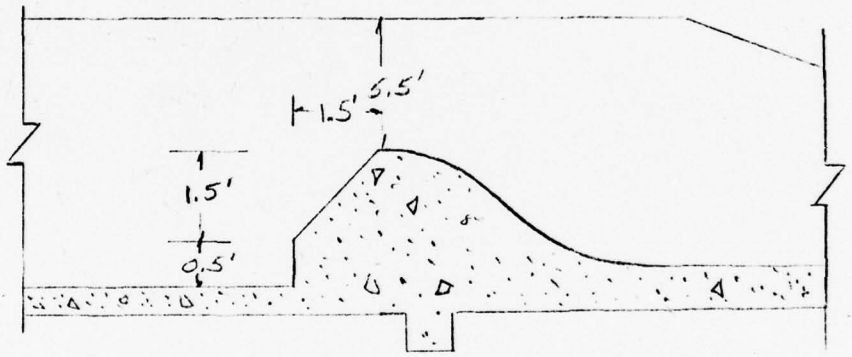
SPILLWAY CAPACITY





SECTION A-A

NOTE: DIMENSIONS ARE TAKEN FROM DRAWING DATED 6-10-57 by J. C. MORIN, REG. ENGR. # 3868 LOCK HAVEN, PA. (VERIFIED DURING INSPECTION)

ASSUME VERTICAL SLOPE ON RIGHT SIDE OF SPILLWAY. ACTUAL SLOPE (AS INDICATED BY DESIGN DRAWING AND VERIFIED IN THE FIELD) IS DEPICTED BY THE DOTTED LINE

SUBJECT DAM SAFETY INSPECTION
BILEY RUN DAM

BY DLB DATE 7-22-78 PROJ. NO. 78-501-386

CHKD. BY JTS DATE 7-25-78 SHEET NO. 5 OF 5

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$Q = C L H^{3/2}$ (REF 3, EQ 21-171)

(FROM FIG. 21-69, REF 3)

$P/H_D = 2.0'/5.5' = 0.36$

UPSTREAM SLOPE OF WEIR = 45°

$\frac{C_{INCLINED}}{C_{VERTICAL}} = 1.02$

(FROM FIG. 21-67, REF 3)

$C_{VERTICAL} = 3.7$

$\therefore C_{INCLINED} = 3.7(1.02) = 3.77$

L = WEIR LENGTH = 100 FEET ← 5 (SHEET 4) →

H = HEIGHT OF DAM CREST ABOVE NORMAL POOL = 5.5 FEET

$Q = (3.77)(100)(5.5)^{3/2} = 4863$ CFS

MAXIMUM DISCHARGE (4863 CFS) > PEAK INFLOW (2227 CFS)

APPENDIX D

PHOTOGRAPHS

PHOTOGRAPH 1 View of Riley Run Dam from the right abutment. The spillway is shown in the foreground of the photograph.

PHOTOGRAPH 2 View of Riley Run Dam from the left abutment. The foot bridge and inlet end of the outlet works are shown in the right center of the photograph.

PHOTOGRAPH 3 View of the Riprap covered upstream face of Riley Run Dam.. The spillway is located along the right abutment in the background of the photograph.

PHOTOGRAPH 4 View of the thickly vegetated downstream face of Riley Run Dam.

1

2

3

4

PHOTOGRAPH 5 View looking downstream through the spillway outlet channel of Riley Run Dam.

PHOTOGRAPH 6 Closeup view of the concrete and steel primary outlet works at Riley Run Dam.

PHOTOGRAPH 7 Detailed view of the Riley Run outlet showing corrosion of steel grating and deterioration of the concrete surface.

PHOTOGRAPH 8 View of the outlet flume and settling basin located just downstream of Riley Run Dam. The photograph was taken from the dam crest.

5

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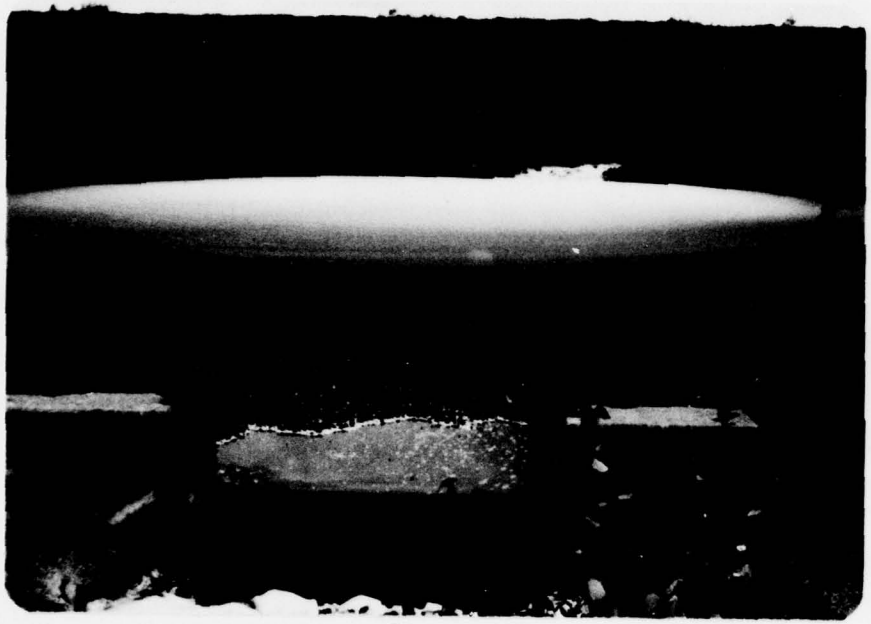
8

PHOTOGRAPH 9 Closeup view of the weir located on the downstream end of the stilling basin. Water passing over the weir is directed into the natural downstream drainage. The embankment is shown in the background of the photograph.

PHOTOGRAPH 10 View of the confluence of Riley Run and the Clarion River located approximately 2 miles downstream of the dam.



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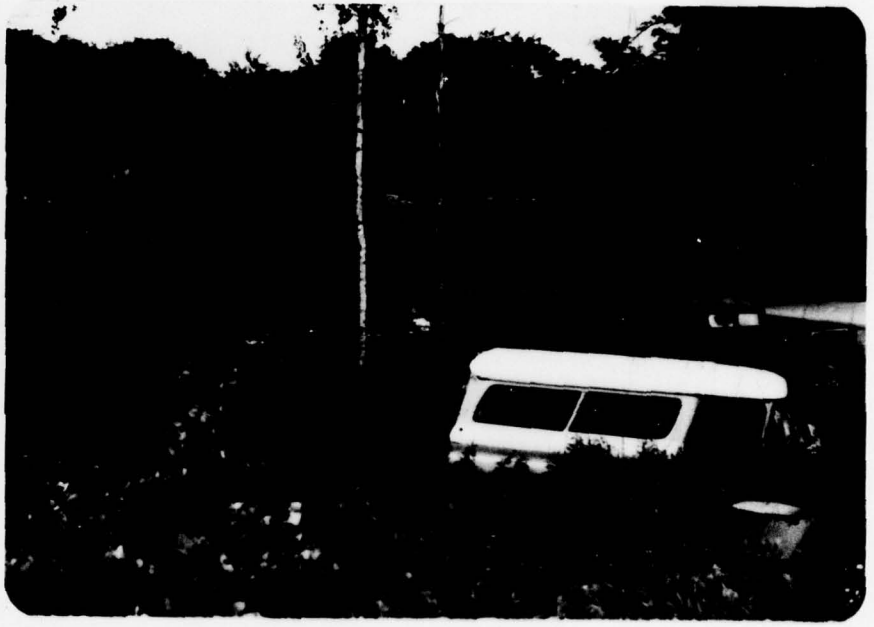

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APPENDIX E

GEOLOGY

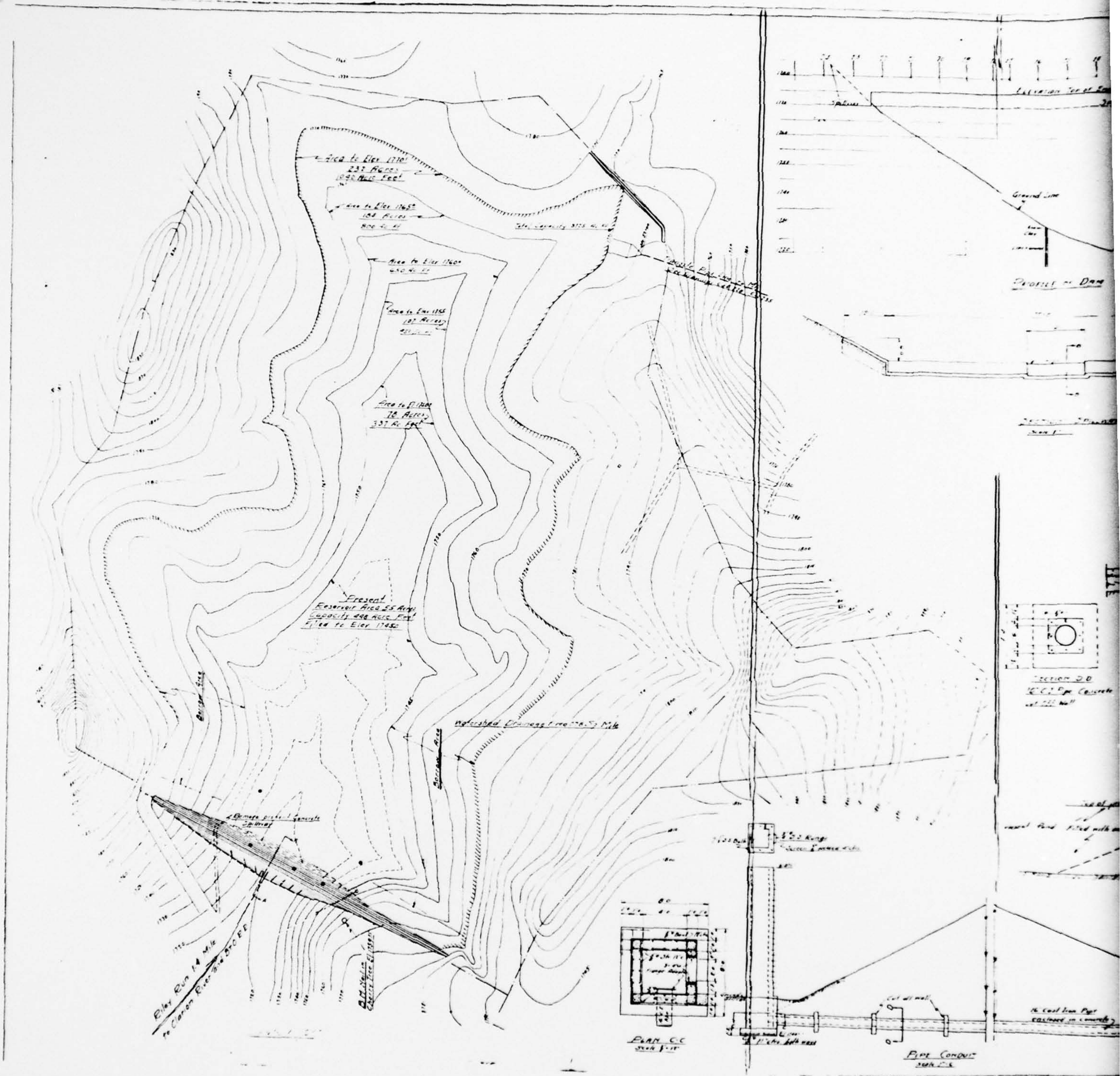
GEOLOGY

Riley Run Dam is located near the axis of the Johnson Run Syncline in Pennsylvanian age sedimentary rocks of the Pottsville Group. The Group is characterized as coarse sandstones and conglomerates of the Johnson Run, Kinzua Creek and Olean Formations with shales, siltstones and coal units predominating in the Alton and Marshburg Formations. The site lies within the unglaciated portion of Northern Pennsylvania; consequently, the soil types vary considerably from the glaciated counties to the east and west. Locally, the soils are commonly thin residual soils derived from the local bedrock. Alluvial and colluvial soils predominate in the steep sided Riley Run Valley approximately 3000 feet downstream of the dam.

APPENDIX F

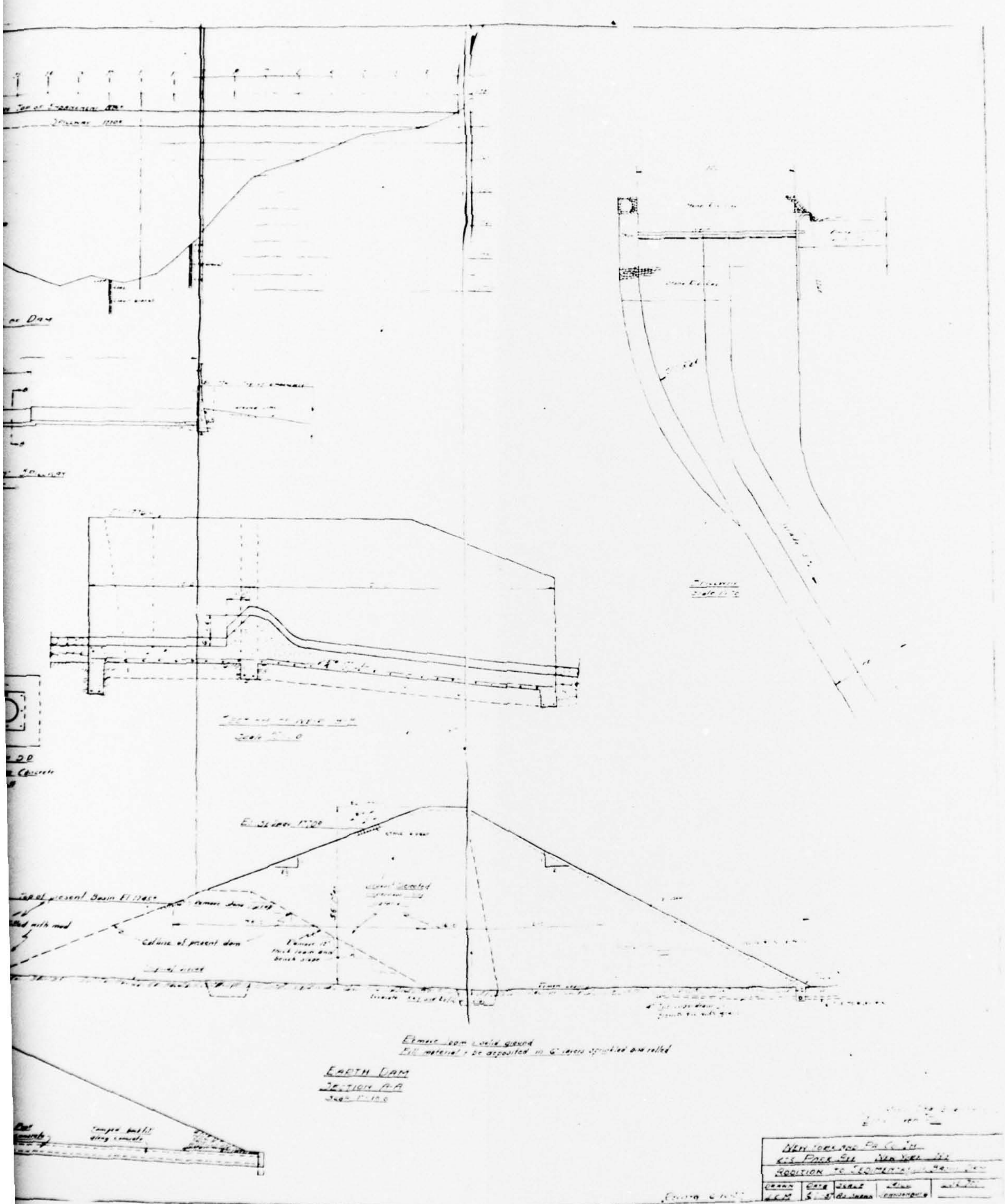
FIGURES

FIGURES



Area to Elev 1770±
Area to Elev 1765±
184 Acres
800 Ac Ft
Area to Elev 1760±
Total Capacity
Area to Elev 1755
Area to El 1750±
78 Acres
337 Ac Feet
Present
Reservoir Area 55 Acres
Capacity 448 Acre Feet
Filled to Elev 1745±
Borrow Area
Profile of Dam
Ground Line
Section DD
Plan CC
Pipe Conduit

1

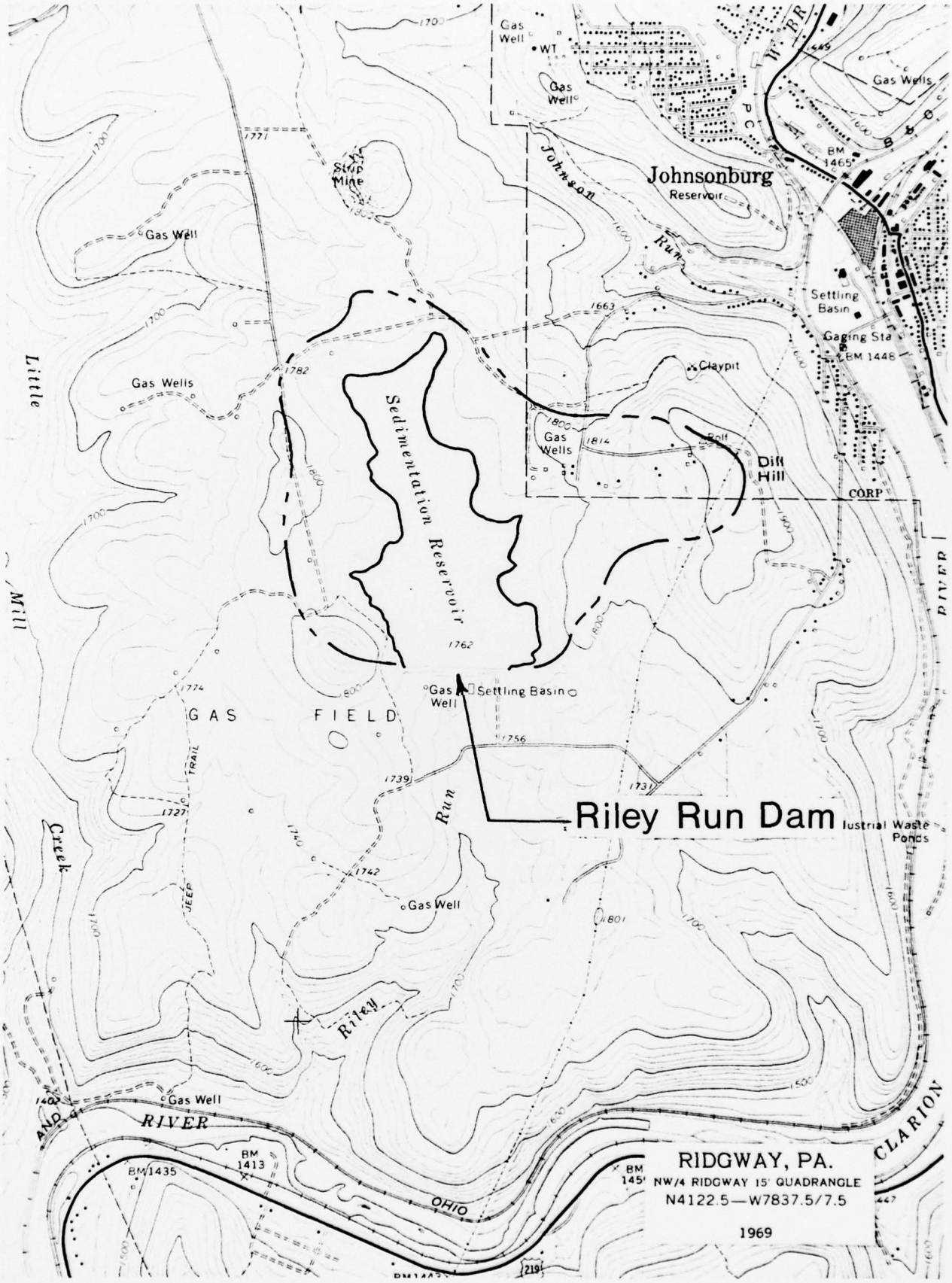


Top of present Dam El
Column of present dam
EARTH DAM
SECTION A-A
ADDITION TO
DRAWN
DATE
SCALE

2

APPENDIX G

REGIONAL VICINITY MAP


Riley Run Dam
Johnsonburg
Reservoir
Sedimentation Reservoir
Gas Well
Gas Wells
Strip Mine
Claypit
Settling Basin
Gaging Sta
BM 1448
Diff Hill
CORP
GAS FIELD
Johnson Run
Little Mill Creek
Riley Run
Industrial Waste Ponds
RIVER
OHIO
CLARION
BM 1413
BM 1435
BM 1465
W. BR
RIDGWAY, PA.
NW/4 RIDGWAY 15' QUADRANGLE
N4122.5—W7837.5/7.5
1969